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EXAMINER

LYONS, MICHAEL A

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07/09/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/568,657	Applicant(s) WHITE ET AL.	
	Examiner MICHAEL A. LYONS	Art Unit 2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 December 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 25-31 is/are rejected.
- 7) ☒ Claim(s) 13-24 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 February 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>032106</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 25-31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 25 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted elements are: the element that imparts the phase shift between the first pair of basis beams. In claim 1, this is not an issue, because the claim sets forth a test piece that imparts a phase shift on the measurement beam of the system relative to the reference beam. However, in claim 25, it is unclear what imparts the phase shift; is it a test piece? Is it an optical path difference between the two beams?

Claims 26-31 are rejected as being dependent upon claim 25 and thereby containing all of the claimed limitations of the parent claim.

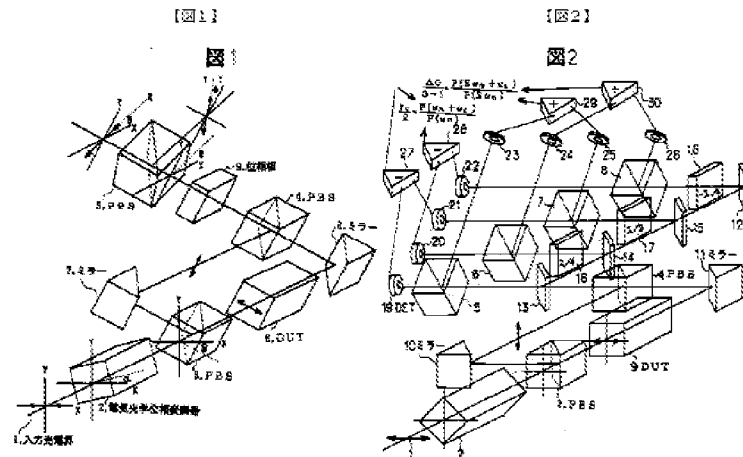
Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2, 6-9, 12, 25-27, and 29 are rejected under 35 U.S.C. 102(b) as being anticipated by Takahashi et al (JP 06147985).



Regarding claim 1, Takahashi (Figs. 1 and 2) discloses an interferometer comprising a beam displacing assembly 3, 4 arranged to split an input beam into orthogonally-polarized first and second basis beams and to combine said basis beams to produce at least one output beam; and a phase analyzer consisting of polarizing beam splitter 5 and a variety of half- and quarter-wave plates arranged to analyze the at least one output beam in two polarization bases that are superpositions of the first and second basis beams and arranged to determine a difference in phase shift imparted to one of said basis beams relative to the other by a test piece 6.

As for claims 2, 6, and 12 see polarizing beam splitters 3, 4.

As for claims 7-9, see Figure 2.

Regarding claim 25, Takahashi (Figs. 1 and 2) discloses an interferometer including means 3 for splitting an input beam into an orthogonally-polarized first pair of basis beams; means 4 for recombining said first pair of basis beams to form at least one output beam; and means consisting of polarizing beam splitter 5 and a variety of half- and quarter-wave plates for

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processing the at least one output beam in two polarization bases that are superpositions of the first pair of basis beams to determine a relative phase shift imparted between the first pair of basis beams.

As for claims 26-27, see polarizing beam splitters 3, 4.

As for claim 29, see Figure 2.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-4, 6, 12, and 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Han et al (6,992,777) in view of DiMarzio (6,020,963).

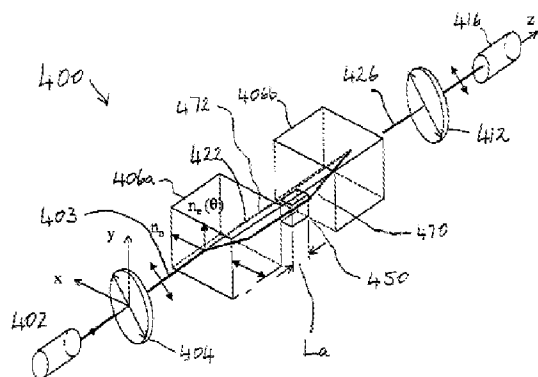


FIG. 5

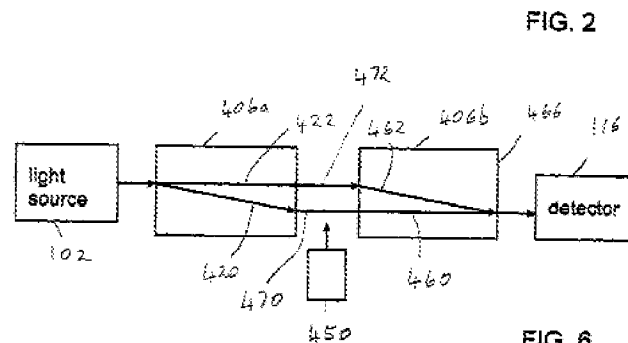


FIG. 6

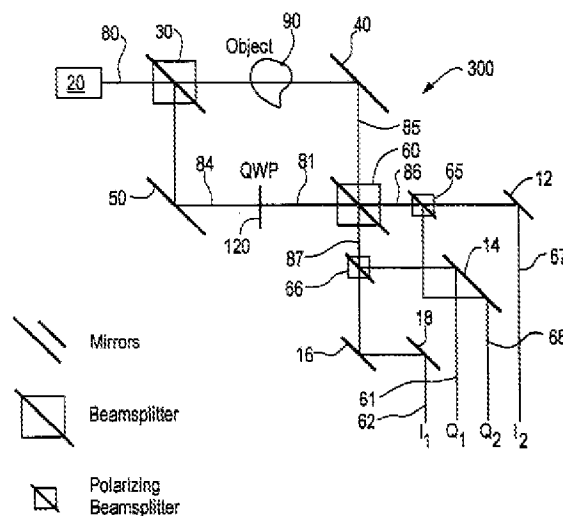


FIG. 5

Regarding claim 1, Han (Figs. 5 and 6, for instance) discloses an interferometer including a beam displacing assembly 406a arranged to split an input beam 403 into orthogonally-polarized first and second basis beams 470, 472 and a beam displacing assembly 406b arranged to combine said beams to produce at least one output beam 426; and a detector 416 that analyzes

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the output beam to determine a difference in phase shift imparted to one of the basis beams in relative to the other by a test piece 450.

Han, however, fails to disclose a phase analyzer arranged to analyze the at least one output beam in two polarization bases that are superpositions of the first and second basis beams.

DiMarzio (Fig. 5, for example) discloses an interferometer that measures the phase shift imparted on one beam by an object 90 relative to another beam via a phase analyzer that uses polarizing beam splitters 65, 66 to split output beams 86, 87 into orthogonal polarizations before being detected and analyzed (see, for instance, Col. 7, lines 11-25).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to add the phase analysis arrangement of DiMarzio to the device of Han in place of the simple detector of Han, the motivation being that the phase analysis arrangement of DiMarzio, by splitting the light by polarization, allows for more beams of light to be detected by the system, allowing for more accurate results that stem from the use of more data points to generate the results.

As for claim 2, the beamsplitters of Han are both polarizing (see Col. 5, lines 34-35, for instance).

As for claim 3, as per Figure 5 of Han, the beam splitters are orientated inversely relative to one another.

As for claim 4, the combined device (in particular, Han) discloses the claimed invention as set forth above regarding claim 2, but fails to disclose a half-wave plate located between the two polarizing beam splitters.

Official Notice is taken, however, as to the well known use of half-wave plates to alter the polarization of light beams in optical interferometry. In this instance, placing a half-wave plate between the two beam splitters of Han would allow for beam splitters that are oriented in the same direction to be used. The half-wave plate will flip the polarizations of the two basis beams so that the originally horizontally polarized beam will become vertically polarized and vice versa. As such, the beams will properly combine and interfere at the second beam splitter; without the flip, the light may not combine properly at the second beam splitter, destroying the operation of the device.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to add a half-wave plate to the combined device between the two polarizing beam splitters, the motivation being to ensure proper functionality of the device when two identically orientated polarizing beam splitters are used as the beam splitting and beam combining elements.

As for claim 6, the beam displacing assembly of Han inherently imparts horizontal and vertical polarizations to the first and second basis beams, respectively, as the beams output from the assembly 406a are orthogonally polarized (see Col. 5, lines 34-41).

As for claim 12, element 406a of Han acts as a beam splitter.

Regarding claim 25, Han (Figs. 5 and 6) discloses an interferometer including means 406a for splitting an input beam 403 into orthogonally-polarized first pair of basis beams 470, 472; means 406b for recombining said first pair of basis beams to form at least one output beam 426; and means 416 for detecting the at least one output beam to determine a relative phase shift imparted between the first pair of basis beams.

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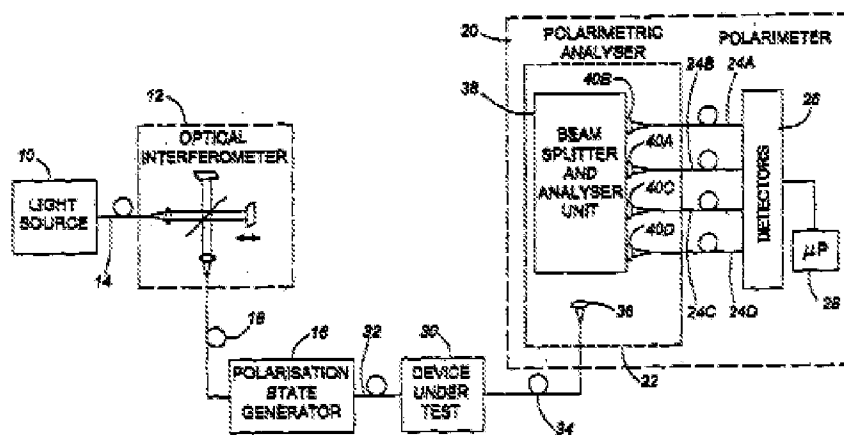
Han, however, fails to disclose the means for processing the at least one output beam in two polarization bases that are superpositions of the first pair of basis beams.

DiMarzio (Fig. 5, for example) discloses an interferometer that measures the phase shift imparted on one beam by an object 90 relative to another beam via a phase analyzer that uses polarizing beam splitters 65, 66 to split output beams 86, 87 into orthogonal polarizations before being detected and analyzed (see, for instance, Col. 7, lines 11-25).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to add the phase analysis arrangement of DiMarzio to the device of Han in place of the simple detector of Han, the motivation being that the phase analysis arrangement of DiMarzio, by splitting the light by polarization, allows for more beams of light to be detected by the system, allowing for more accurate results that stem from the use of more data points to generate the results.

As for claims 26-27, the beam displacing assembly of Han inherently imparts horizontal and vertical polarizations to the first and second basis beams, respectively, as the beams output from the assembly 406a are orthogonally polarized (see Col. 5, lines 34-41).

Claims 5 and 29-30 rejected under 35 U.S.C. 103(a) as being unpatentable over Han et al and DiMarzio as applied to claim 27 above, and further in view of Ruchet (6,856,398).



As for claims 5 and 29-30, the combined device of Han and DiMarzio, as set forth above regarding claim 27, discloses the claimed invention, but fails to set forth the means for processing the at least one output beam comprising a polarimetric phase retrieval assembly, with the phase retrieval assembly being arranged to calculate the phase shift from signals representing Stokes parameters.

Ruchet (Fig. 1), however, discloses an interferometric device featuring a polarimeter 20 to polarimetrically analyze light from a device under test 30. This device further features the use of Stokes parameters (see Col. 4) during operation.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the polarimeter of Ruchet in the combined device of Han and DiMarzio as the processing means, the motivation being that the polarimeter of Ruchet provides for wavelength-resolves polarimetric measurements indicative of properties of the device under test, regardless of the arrangement of the rest of the elements of the device and regardless of the path the light travels through the device prior to detection and processing (see Ruchet abstract).

Claims 10-11 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi et al (JP 06147985) in view of Ruchet (6,856,398).

As for claims 10-11 and 30, Takahashi discloses the claimed invention as set forth above, but fails to disclose the use of Stokes parameters in the calculation of the phase shift.

Ruchet, however, discloses the known use of Stokes parameters in optical interferometry to assist in interference analysis.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use Stokes parameters in the phase analysis of Takahashi in view of Ruchet, the motivation being that Stokes parameters, as disclosed by Ruchet, are a known, accurate manner of performing phase analysis that generates accurate results.

Allowable Subject Matter

Claims 13-24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 28 and 31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

As to claim 13, the prior art of record, taken either alone or in combination, fails to disclose or render obvious the further limitations of claims 1 and 12, including first and second

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holographic plates arranged to impart respectively orthogonal spatial modes to said first and second basis beams, in combination with the rest of the limitations of all the above claims.

As to claim 28, the prior art of record, taken either alone or in combination, fails to disclose or render obvious the further limitations of claims 25 and 26, wherein the means for splitting the input beam is arranged so that the first pair of basis beams comprises respective orthogonal spatial mode beams, in combination with the rest of the limitations of all the above claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Pat. 6,462,827 to Frankel, and US Pat. 6,606,158 to Rosenfeldt et al.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL A. LYONS whose telephone number is (571)272-2420. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley can be reached on 571-272-2800 ext. 77. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Michael A. Lyons/
Primary Examiner, Art Unit 2877
July 7, 2008